編號： 131

國立成功大學 108 學年度碩士班招生考試試題

系　　所：航空太空工程學系

考試科目：材料力學

考試日期：0223，節次：1

※考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. A cylindrical pressure vessel 1.50 m in diameter is constructed by warping a 15-mm-thick steel plate into a spiral and butt-welding the mating edges of the plate as shown in Fig.1. The butt-welded seams form an angle of 30^0 with a transverse plane through the cylinder. Determine (a) the hoop stress σ_h, (b) the axial stress σ_a, (c) the normal stress σ perpendicular to the weld, and (d) the shearing stress τ parallel to the weld when the internal pressure in the vessel is 1500 kPa. (25%)

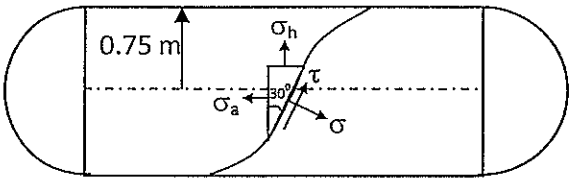

Fig.1: Pressure vessel with internal pressure

2. At a point in a structure member subjected to plane stress there are normal and shearing stresses on horizontal and vertical planes through the point as shown in Fig.2. Determine the principal stresses and the maximum shearing stresses at that point. (25%)

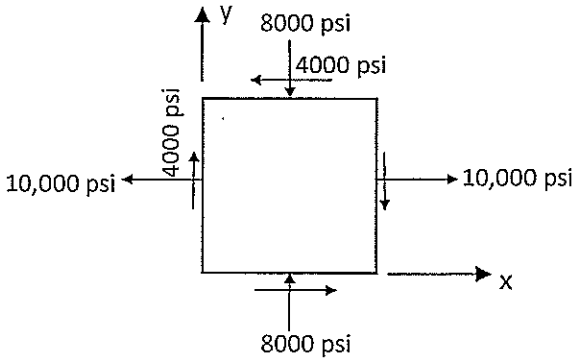

Fig.2: Plane stresses in a structure member

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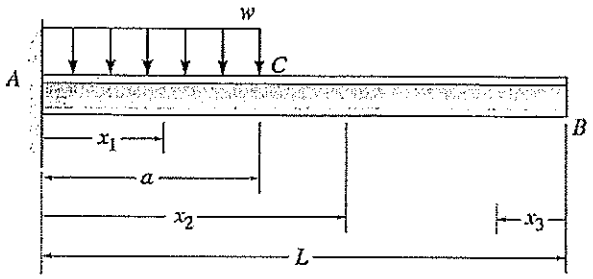
3. (25%) Determine the equations of elastic curve for the cantilever beam of bending rigidity *EI* using the coordinates x_1 and x_3, and find the slope and deflection at the free end *B*.



4. (25%) Consider a column that is fixed at the base and pinned at the top (as shown below). The column is uniform and of bending rigidity ***EI***.

(a) Derive the buckling equation for the buckling load P_{cr} of the system.

(b) Estimate the buckling load P_{cr} by using the concept of effective length.